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ANIMAL KINGDOM

THE MAGAZINE OF THE NEW YORK ZOOLOGICAL SOCIETY

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ANIMAL KINGDOM

Bulletin of the New York Zoological Society

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It doesn't seem possible to take a picture of a Gerenuk in an awkward and ungraceful pose. The alert, intense gaze, the delicately poised foreleg, in this photograph are typical of the attitudes "Gerry" struck for Staff Photographer Sam Dunton – not once, but repeatedly – when he went down to the Antelope House to get a cover picture for *Animal Kingdom*. For a while, though, we thought we would have to settle for a photograph of the Gerenuk standing on his hind legs with his forefeet on Keeper Dapolite's chest or shoulders; the keeper had been feeding him bits of banana and he wanted to go right on enjoying that luxury.

Destiny and Dollars

A FEW INSTITUTIONS—of which ours is one—proceed through the years under the influence of an unusually favorable destiny. This destiny may be described as "an irrepressible tendency to grow." The history of our Society from its formative years half a century ago is a story of the acceptance of opportunities and progress. Similarly an unending series of opportunities faces us in the future. The question is, "Can we meet them?"

This brief soliloquy concerning our Society and its "place in the world" is currently exemplified by the announcement of the establishment of the new Department described on the following pages. A careful reading of this announcement will convey the importance of this new activity that will be undertaken by some of the members of our staff and their associates in other institutions. Without minimizing the significance of this highly important plan, it is only one of a number of "high priorities" for which we must gain very substantial financial support.

I happen to believe in the adage "ideas come cheap." It is always a question of the dollars with which to carry them out. This may not be invariably true, indeed it is *untrue* in the sense of an individual's creative accomplishments, but it is everlastingly true in the case of our Society which is dedicated to public interests on so large a scale.

The goals still to be reached include the completion

f the new Aquarium that can one day be the greatest
the world, a program of constant improvements at
e Zoo, the advancement of work in conservation in-
uding especially the protection of wildlife, stimulation
f our educational activities and, finally, the seeking of
reater knowledge of life processes through expanded
rograms of scientific research. These objectives can-
ot be reached without large sums of money either in
e form of direct gifts, or, for the long pull, in the
rm of legacies. Our Society has indeed an "irrepres-
ble tendency to grow." We have a special obligation
refresh people's lives with the living wonders of
ture at a time when men's thoughts are so dampened
the stresses and preoccupations resulting from the
rival of the atomic and missile age.

Our Society seems to have the reputation of being
omfortably well off." This is a total misconception
our present resources are measured against the things
e must accomplish. Never in our history have we
en in such financial need because never before have
e opportunities for growth been so evident.

Fairfield Osborn

A New Department of Marine Biochemistry and Ecology

By FAIRFIELD OSBORN

IT IS A GREAT SATISFACTION to announce the establishment of a new department to be known as the Department of Marine Biochemistry and Ecology. It has been the practice of our Society to endeavor to handle its varied activities through an administrative set-up that is not broken down into too large a number of different divisions of responsibility. As evidence of this policy, the last time a separate department became formally established was in the year 1916 when the Department of Tropical Research came into existence under the direction of Dr. William Beebe.

However, there can well be exceptions to any general rule. In this instance we believe we are presented with an extraordinary opportunity for scientific accomplishment in a field which is as yet relatively unexplored. Scientists have long recognized the importance of controlling temperature, alkalinity, oxygen, carbon dioxide, nitroge and salt content of sea-water in order to properl maintain marine organisms in captivity. Mem bers of our Aquarium staff, who are familiar wit aquarium management, have also recognized tha there are more subtle factors that may affect th health of fishes and other marine life. For in stance, water in which sharks or their relative have been kept for some time is known to b unsuitable for many other fishes. Certain fis placed in such water will soon lose their brigh color, normal behavior pattern and appetite, an may eventually die. The factor or factors r sponsible for this effect are found in the sub stances called metabolites, which are secreted o excreted by sharks. The process of modifying th biochemical nature of water by organisms i called *conditioning*. This is now recognized as basic principle in aquatic biology.

It is known that *conditioning* factors are usu-
ly present in relatively small amounts. Modern
chnology has made it possible to determine the
nds and amounts of organic compounds in the
arine environment. Thus, biochemists have
monstrated that biologically active substances
ch as steroids, carotenoids, polysaccharides,
nino acids and vitamins are present in varying
nounts in different environments of the sea.
the use of sensitive micro-organisms some of
r collaborators have been able to detect the
esence of Vitamin B_{12} in aquatic environments.
his knowledge helps to explain the "blooms" of
e highly lethal "red-tide" organism (the dino-
gellate, *Gymnodinium brevis*), which also re-
ires this vitamin for proper growth. The toxic

d the scenes" in the Stage One building of w Aquarium at Coney Island Dr. Ross F. has a laboratory equipped to work on most problems that concern the new Department.

bstance which is responsible for catastrophic
lls of fish, birds, marine mammals and inverte-
ates in warmer seas has not been definitely
entified. Apparently it is an alkaloid with
ychnine-like action

Holothurin, a powerful poison produced by
sea cucumber (*Actinopyga agassizi*), was first
olated by Dr. Ross F. Nigrelli, our Aquarium
thologist. This substance is now the subject
an intensive investigation by our staff and by
llaborating biochemists. This material is a
gitalis-like steroid saponin, and animal experi-
entation has shown that it has some anti-cancer-
s, anti-blood-coagulating and heart-stimulating
operties. An understanding of the chemical
rmula may lead to a modification or synthesis
a less toxic and more useful drug. The bio-
emical and pharmacological studies of this com-
und are being supported by our Society, the
ational Science Foundation, the Office of Naval
esearch and the Damon Runyon Memorial
und.

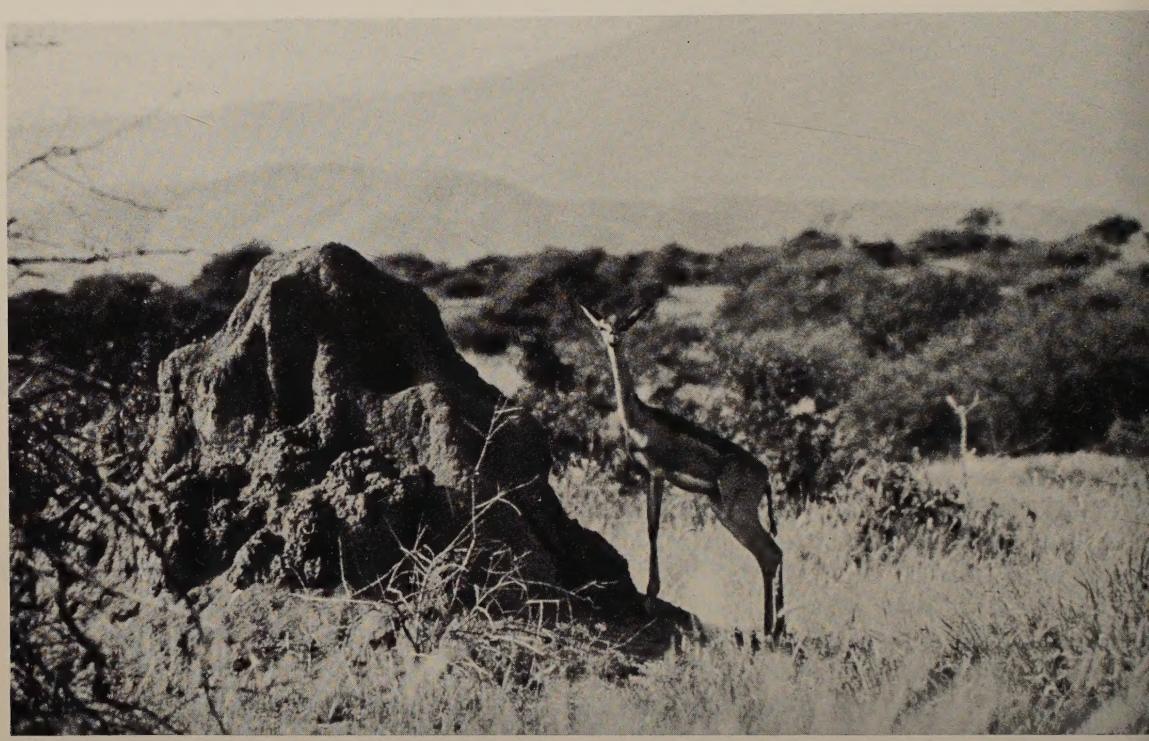
Many of the members and friends of our Soci-
are probably unaware that research activities
ch as the above are intimately associated with
e proper management of a large marine aquar-
m. The factors that lend themselves to study
are basically similar to those investigated by oceanographers, limnologists and marine biologists generally. Each aquarium tank with its individual water circulation represents a working model of an ecological niche where all the physical, chemical and social factors are interacting to affect the community as a whole. The differences between a biotic system in an aquarium and in a definite area of the ocean are mainly quantitative.

The study of these *conditioning* substances is just one of the basic purposes of the new Department of Marine Biochemistry and Ecology. We feel justified in hoping that further knowledge of these substances will lead to a better understanding of the biochemical processes of marine ecology and will help to solve the riddle as to why the composition of phyto- and zooplankton undergoes drastic changes in different parts of the ocean. This knowledge is important if we are completely to understand the economy of the oceans and, in turn, to utilize marine resources that are potentially available for human welfare. Although it is well known that the oceans and seas make up slightly more than 70% of the earth's surface, it is not generally recognized that acre for acre the sea has a greater productive potential than the land.

It is fortunate that the first unit of the new Aquarium at Coney Island presently contains a laboratory well equipped with modern instruments and other technical aids. As the Aquarium grows we may hope that these laboratory facilities will be extended. In any event, present facilities are adequate to provide the initial background for the work to be done by this new Department, while at the same time the laboratory fulfills its primary task of maintaining the marine collections in the Aquarium in good condition.

This new Department is the first of its kind in the United States. The advantages of the location are great both as to geographical position and the availability of academic and other specialized personnel. The Department will be under the chairmanship of Dr. Nigrelli, whose accomplishments in his field of scientific research are already so widely recognized in our own country and abroad. We feel sure that he and those associated with him, within and outside our own organization, will gain rich results in this challenging field of scientific exploration.

TWO "FIRST-TIMERS" FOR THE ZOO



THE GERENUK

By OLIVER MILTON

Former Game Ranger, Tanganyika Game Department

USUALLY, I am told, only members of the staff, and keepers, and sometimes newspaper reporters and photographers, are present when an important new animal arrives at the Zoological Park. The reason is that an atmosphere of calmness and quietness must be maintained when the animal – often shy and apprehensive – is introduced to its new home.

I was especially privileged, then, on the afternoon of October 1 to be in the small group in the Antelope House when a keeper slowly raised a sliding door and, after a slight pause, out stepped a male Gerenuk . . . so delicate and graceful that the onlookers audibly gasped at his beauty. It was the first Gerenuk to be on display at the Zoo, and everyone – save a few who had visited East Africa – was seeing this species for the first time.

The Gerenuk (*Litocranius walleri* Brooke) is a curious-looking little antelope and the Kiswahili name of "Swala twiga" is apt. It means "antelope giraffe." The uniformly light brown head with white patches near the eyes is comparatively small and rests on an absurdly long and

thin neck about eighteen inches in length. The great, dark, almost black, eyes seem too large for such a little head but owing to their height above the ground they enable the Gerenuk to get a good view of the surroundings and locate any possible enemies. As Leopard and Cheetah share their environment, Gerenuks fall easy prey to these swift killers. Their relatively small chestnut-brown body is supported by legs so delicate that the slightest blow must surely break them, and yet in the wild they seem to suffer no such misfortune.

"Mahali pa swala twiga" (Place of the Gerenuk) was the name I gave to a few acres of isolated thorn bush country about twenty miles north of my home at Lake Manyara in Tanganyika. I christened it thus because every time I visited the area during my term as Game Ranger – from 1949 until 1955 – I saw Gerenuk. This was the southern limit of their range, which extends north through Kenya to Somaliland and south Ethiopia.

They reminded me of a party shipwrecked on a lonely island. To the west the forest-clad Rift Wall rose almost perpendicularly from 3,500 feet to the 12,000-foot grassy peak of Ela Nairobi (Masai for "The-[Place]-of-the-Cold"), slightly northeast of Ngorongoro Crater. To the east great plains, dotted here and there with acacia and euphorbia, stretched to the foothills of Monduli mountain. To the north the country had once been covered with bushes but now, over-run by the Masai and their cattle, the land had been turned into a desert of dust and dead stumps. Nearby lay a vast soda lake from which, during the hot month of October, great clouds of choking pink dust would rise to several thousand feet and then, blown on a gentle breeze, slowly smother the countryside in a silent, pale red darkness. To the south the environment was little better and it was a spot favored by hunters from many countries.

Each time I drove there I would stop near the base of a small rocky hillock because the thorn bushes started to grow several hundred yards ahead. Many of the bushes were draped with the pendulous nests of the Sudan Dioch (*Quelia*) which became so numerous that they were a threat to the farmers who lived several miles away. In flocks of many hundreds these little birds would make daily sorties to the fields of wheat and devour literally bags of grain. The bushes sheltered the Francolin and Guinea Fowl during the hot hours of the day. One could guarantee seeing two or three of these birds lying in a heap of scratched up dust against the shady stems. The bushes also afforded cover and food for the Gerenuk and as their sense of sight was very acute I would examine the area carefully

this anthill in Tanganyika the author could be n almost always of finding one or more Gere- although at the first sight of him (or for no rent reason) they often trotted away, as below.

Photographs by the author

Probably because it was hand-reared in Africa, the Gerenuk likes human companionship. Keeper Dapolite quickly made friends, and finds time every day to play with "Gerry."

with my binoculars, hoping to see them before they saw me and moved to thicker cover. Nature has equipped many species of wildlife with some sort of camouflage and although Gerenuks stand about four feet high it is sometimes impossible to spot them. When they "freeze," their spindly legs appear as stems and the remainder of the body is hidden by the tangle of branches and twigs of the thorn bush.

There is little difference between the sexes except that the male has heavily-ringed horns which attain an average length of fifteen inches. The record is seventeen and a half inches.

Their diet consists largely of acacia leaves which they pluck with their long, plum-colored tongue. To reach foliage a little higher off the ground they rear up on their hind legs and, like a goat, support their fore legs on the upper branches of the bush. Because of their thin body and the light color of their bellies, it is especially hard to see them in this position.

They seem to have a natural curiosity and I have often watched a pair of them just stand and stare at me without making a movement until suddenly, and with no apparent reason, they stretched their necks in a horizontal position and loped away in a peculiar trot, lowering their heads still further to pass beneath the thorny branches.

Their habitat is usually far from water. Except during the rainy season when the ground is covered with puddles, they obtain water, like many other animals, by chewing the bark and roots of various acacias and succulents.

The young are usually born in time to enjoy the tender new leaflets that appear with the first rains, but like the new-born Thompson's and Grant's gazelles, they are in danger of being seized by the roving, ever-hungry Hyaena.

Gerenuk are not sought after by most hunters. They are not found in herds, but singly or in pairs except when with young. Perhaps it involves too much time to find one or maybe the size of the trophy is not considered worth the effort. Furthermore a shooting license costs about $110 and this is an additional deterrent.

At any rate there are still numbers of Gerenuk in the bush, and I feel sure that when visitors to the zoo see the fine male specimen that has just been acquired they will agree that the animal is well worth preserving.

THE LESSER KUDU

By JOHN L. GEORGE

All of us — visitors and staff alike — have been so entranced by the grace and gentleness of the first Gerenuk in the Zoological Park that we are in danger of overlooking another newcomer from Africa that arrived at the same time. This is a female Lesser Kudu, *Tragelaphus imberbis,* also being seen for the first time in our collection and housed directly across the hall of the Antelope House from the Gerenuk.

The Lesser Kudu has been described as "undoubtedly the most beautiful of all Somali antelopes," and one does not have to have a wide acquaintance among Somali antelopes to recognize this as a lovely creature indeed. It is only about half-grown (the Lesser Kudu weighed 63 pounds on arrival, the Gerenuk 42 pounds) and its general color is a warm brown. Its sides are vividly marked with white stripes; these are seldom bi-symmetrical and our animal has 14 stripes on her right side, 13 on her left. There is a broad transverse bar of white at the base of the throat and white markings below the ears and eyes. The native name is "Adir," meaning the possessor of stripes.

Male Lesser Kudus are much darker and have spiral horns two or three feet long. They are said to be found singly, as a rule, but may join females and young to form a small herd of four or five animals in the dry bush country of the lowlands, sometimes in quite waterless districts.

Like many mammals of the bush country, these little antelopes are most difficult to see when they are standing motionless, and they may allow one to get very close before they spring away. In dense bush they use a jumping gallop and have been seen to clear bushes six feet high and to leap thirty feet when pursued by Hyaenas or Wild Dogs or Lions.

In the wild the Lesser Kudu browses shrubs and succulent growth, but in our Antelope House the "Adir" is prospering on grains and carrots, bread and bananas. She enjoys company and will come to her keeper to be stroked on the head and neck.

In fact, both the Gerenuk and the Lesser Kudu are fond of human companionship, undoubtedly as a result of their early history. Both were taken as newly-born fawns in March of last year along the Juba River in equatorial East Africa (Somaliland). They were hand-reared at Gobwen, a small village near the place where they were taken, and in their first winter were sent to Mombassa and from there to New York.

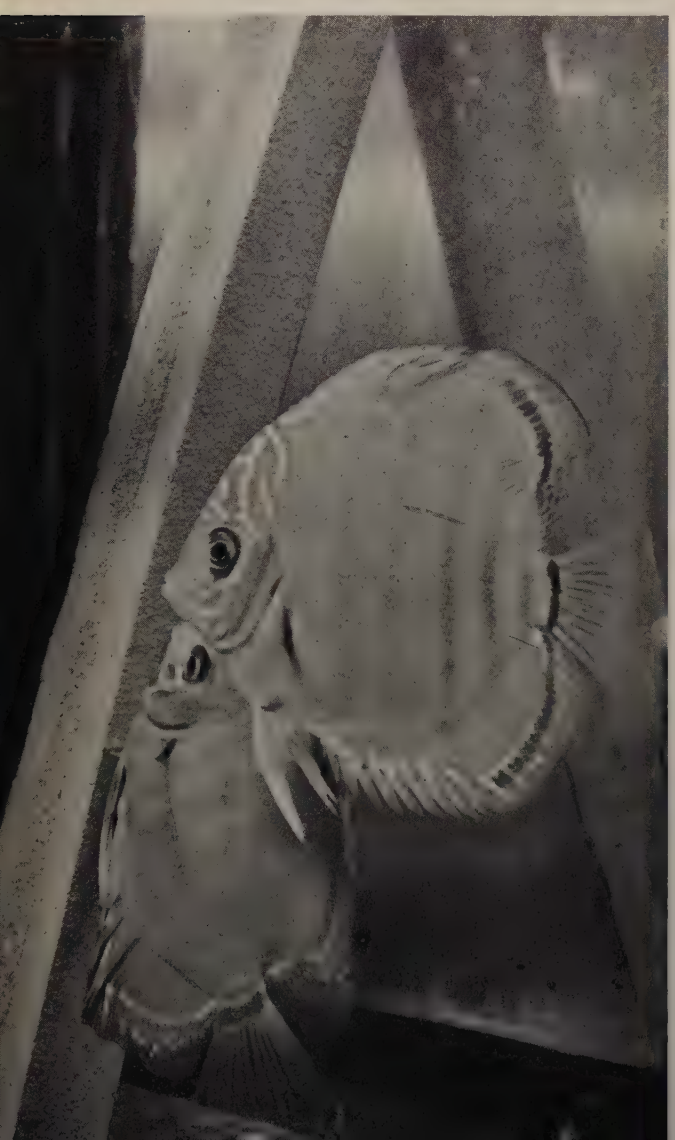
The Lesser Kudu is perhaps naturally more shy than the Gerenuk; at any rate, she prefers to stay well away from visitors, although keepers can approach her if they move slowly.

The Surprising Story of

Hitch-hiking Discus Babies

By MYRON GORDON
Photographs by GENE WOLFSHEIMER

EVERY AQUARIST knows that the female guppy gives birth to living young, that the male Tilapia incubates its eggs within its mouth, and the male Betta builds a bubbly nest for its eggs and then guards it against all intruders. The reproductive behaviors of these fishes are the smaller wonders of the world which aquarists take pride in demonstrating to their neighbors. Now they may add another wonder, because some fortunate fish fanciers have recently discovered that the five-day-old fry of *Symphysodon discus,* the king-size cichlid fish, after hatching from their eggs, swim straight to their closely hovering parents and climb aboard their saucer-shaped bodies to find both security and sustenance. A week or so later, when the young have gained more size and greater strength, they check out from their parental trailers, swim away, and face the world on their own.



I must confess that when I first heard fragments of this seemingly fantastic hitch-hiking, chuck-wagon, story about the Discus, I was skeptical. But my skepticism vanished when I read the convincing evidence that Gene Wolfsheimer, an extraordinary fish fancier of Sherman Oaks, California, presented – and supported by publishing a remarkable series of candid photographs of Discus parents and their young in action.

For almost a quarter of a century aquarists had endeavored to solve the riddle of the Discus's complete breeding habits. Within the first year of their arrival in the United States from the Brazilian Amazon in 1933, a pair spawned in Gustav Armbruster's aquarium in Philadelphia, and subsequently other fanciers obtained spawn and fry, but rarely has anyone reared Discus young in any numbers. Now we think we know their secret, and a surprising one it is.

When Armbruster bred the fish for the first time in 1934, he learned very little, for the eggs were infertile. Next year, in early May of 1935, the pair spawned again in an aquarium main-

Like sheep on a meadow, the cichlids nibble at the algal growth and scour the surface at the place where they intend to deposit eggs. Here the concrete upright has been cleaned.

tained quite warm at 85°F.; this time their eggs were fertilized and after three days the embryos hatched. Armbruster learned to feed them on tiny aquatic organisms and a few Discus were actually reared to adult size, but large gaps remained in our knowledge of their complete life cycle.

In the meantime, Dwight Winter of Pittsburgh also had obtained a pair of Discus and they spawned three times in his well-planted 100-gallon aquarium. The eggs of each spawning proved to be infertile and the parents ate them. This act may appear to be close to cannibalism, but in reality the pair were most likely motivated to remove all foreign objects from a site chosen for their next spawning. After they spawned for the fourth time, on a stone, the Discus parents transferred the hatched fry to the aquarium's water filter tube. Here the young led precarious lives because they kept falling down to the bottom of the aquarium. Although their parents rescued them repeatedly by sucking them into their mouths and spewing them out toward the filter tube, every young Discus eventually disappeared. On their fifth try the parents moved their fry to the roots of some water lettuce plants where some survived long enough for Winter to see them swimming and following their parents about the aquarium. If all had gone well, Winter perhaps would have discovered the secret of *Symphysodon,* but at this stage the parents deserted their young in order to spawn again. Winter rescued a few free-swimming young Discus but he could not rear them.

In 1938 Hansjoachim Mitsch of Berlin's Zoologischen Museum managed to rear 46 young, after removing the parents and replacing them by a mechanical aerator, but he, too, learned nothing of the offspring-parent relationship.

The first suggestion of the actual behavior came from the observation of Mrs. W. T. Dodd of Portland, Oregon, in 1949. After watching her Discus spawn and their eggs develop on the front glass of her 60-gallon aquarium, she reported that "the babies hung against the sides of the parents, receiving free rides—using the breeders as landing-fields." This significant observation would have been lost had not Wm. T. Innes, editor of *The Aquarium,* spotted it in an obscure mimeographed monthly report of the Oregon Aquarium Society. Thus the way was paved for Gene Wolfsheimer's more detailed report, based on a few pairs he had under observation.

When biologically ready to spawn, both the male and female Discus work over a selected spawning spot. Like sheep on the meadow, they nibble away the algal growth and scour the undersurface of a leaf or stone with their strong nibbling teeth. Once the site is prepared, the female Discus extends her previously hidden genital tube (which now becomes quite conspicuous) and rubs it against the leaf or stone. Through this tube she emits a continuous linear

The eggs — tiny dark spots on the blade of an underwater leaf — are being fanned by the parents to create a constant flow of fresh water, and they may also "mouth" the eggs.

For the first four days after hatching, organic threads held the fry to the spawning site. Then they broke loose and swarmed aboard one or the other parent, for a free ride and food.

stream of clear, translucent eggs which instantly become attached to the site. The male follows in the female's path and sprays a cloud of milt over the eggs. Spermatozoa in the milt fertilize the eggs and thus a new generation of Discus begins its existence.

With fanning beats of their fins the parents hover at the spawning site and create a constant flow of fresh water for their oxygen-needy embryos. They also mouth the developing eggs frequently and this keeps them clean of injurious bacteria and other micro-organisms that, despite the fanning, might settle upon them. Like the orally-incubating cichlids, they may have antibiotic secretions which they impart to their spawn in the process of mouthing. When the female is fanning and mouthing the eggs, the male guards the breeding site against intruders. At intervals the male moves up to relieve its mate, and then the two execute an exchange of duties most gracefully and without missing a single beat of their fins.

In Wolfsheimer's aquarium, which he maintained at 79° F., the Discus eggs hatched three days from time of spawning, but he noticed that the fry remained confined and helpless because each was attached by an organic thread to its

Most of the babies have made the transition from one parent to another. Apparently they find food on the skin of the parent.

How thickly the young cling to the bodies of the adults is well shown in this "tail-on" view. In about a week, the exodus begins.

spawning site. Four days later, after having completely absorbed the last of their yolk, the fry broke free of their tether, made a bee-line toward their parents and climbed aboard. There they obtained a double advantage—a free ride and a free lunch. Wolfsheimer watched them dig

their heads into the soft skin of their parents and then jerk their tiny jaws back and forth as if they were tearing some food particle loose. After nibbling a while on the mother-fish, some fry, expecting better pickings on their father, swam over and sampled him. Nobody knows what this home-grown food is. Gene Wolfsheimer thinks it is the slime on the body, although ordinarily fish slime is a protective secretion and slightly toxic. Perhaps the young Discus feed on some microscopic organisms that live commensally on the skin of their parents, somewhat like the organisms attached to the backs of some aquatic turtles.

After residing on the parental chuck-wagons for a week, the more enterprising youngsters dropped off, momentarily at least, to seize a hovering shrimp nauplius or tiny rotifer; then they returned to the parent. They grew quite rapidly and eventually left their anchorages for good.

While Wolfsheimer revealed the basic fact that the Discus fry seek and feed upon their parents' backs, there is much still to be discovered to round out the life story. Do the fry during their attachment to their spawning site become accustomed and conditioned to the sight of the ever-waving fins of their guardians? When free of their tethered existence are they impelled to swim towards fanning fins because these movements have become critical "come-on signs" to them? Once aboard their parental diner, what do they actually eat?

These are some of the questions that aquarists might keep in mind. Amateur fish fanciers have already provided answers to some equally baffling questions concerning the remarkable lives of fishes. Every aquarist has the possibility of being a discoverer of new scientific facts if he looks upon his home aquarium as a miniature biological laboratory. He, too, may reveal a new small wonder of the world, and astonish his friends — and even scientists!

Three young Discus, well beyond the age when they are dependent upon their parents. Much is still to be learned about their habits — much that amateur fish fanciers can learn at home.

Is Temperature the Secret?

HOW TO FEED A BUSHMASTER

By JAMES A. OLIVER

MANY SNAKES — indeed, one might say all snakes — exert a fascination over people in proportion to their supposed deadliness. That being so, it is not surprising that the big, venomous South American snake known as the Bushmaster has a high rating as an attraction in reptile exhibits. The very name "Bushmaster" enhances its reputation. Unfortunately, it is not exhibited as frequently and as constantly as Zoo visitors — and Zoo curators — would like, because it seldom thrives in captivity.

Typically a healthy-looking Bushmaster comes into the collection, refuses all food or at best eats only once or twice, slowly starves, fails to shed its skin properly, and soon dies. It has almost reached the point where few zoological parks feel they can afford such a snake that is high in price and has a short life expectancy.

Now, however, we have undertaken an experiment that makes us hopeful of a better future for *Lachesis muta* in reptile collections.

The best record I am aware of for a Bushmaster in captivity was set partly in the New York Zoological Park. On February 2, 1935, Prof. F. W. Urich of Trinidad obtained a young Bushmaster about 18 inches long. It fed readily enough on the wild mice he trapped, and by early October it had shed its skin twice and had grown to 20 inches. Knowing that Dr. Raymond L. Ditmars, then the Curator of Reptiles at the New York Zoological Park, was especially anxious to have a Bushmaster on exhibition, Prof. Urich sent it to him. It arrived on October 14, and on October 31 it ate its first meal in the Zoo. Thereafter it ate regularly and lived for almost a year, dying as the result of an accident on October 7, 1937. At death it was 40½ inches long.

From this experience, it seemed likely that a young snake might do better in captivity than an older and larger one, and we sent a request to Dr. William Beebe to try to have a baby Bushmaster captured by the people of his laboratory in the Northern Range of Trinidad. But Dr. Beebe reported that while he had seen many Bushmasters in the wilds of British Guiana, Venezuela and Trinidad, he had never seen a small one; as far as he was concerned they came only in large sizes.

Nevertheless, when I visited the laboratory in 1956 he performed one of his customary miracles and produced a 20-inch Bushmaster for me. This was almost too good to be true; the snake was almost exactly the size of the one Prof. Urich had worked with. Equally exciting was the fact that it started eating immediately, and ate with encouraging regularity.

In Trinidad, that is. For when I brought the snake to New York, it left its appetite behind and never accepted another meal. In a short time it died, as so many other promising Bushmasters had done. This was a frustrating experience. *Why* would it not eat in New York?

My next chance to work with a Bushmaster came last summer when Dr. David Snow, the resident naturalist at the Simla Station in Trinidad, sent us a sleek, 36-inch specimen caught near the laboratory. We tried to make it feel at home, giving it a cage with an area of earth, a living plant, a small box to hide in, a large water dish and a floor covering of dry cacao leaves. Anticipating our needs in case just such a Bushmaster as this one came along, I had brought back six frozen Spiny Rats, for Dr. Beebe and I had found that several Bushmasters killed in

Trinidad had fed on these animals. Unfortunately, the rats were too big for this small snake, so we tried rubbing other freshly-killed food on them to pick up their odor. We also tried wrapping dead white mice in the skin of a Spiny Rat. We tried many other kinds of food and all were consistently refused. It was the same old story repeating itself.

The normal place to keep a snake undergoing feeding experiments is in the Quarantine Room in the Reptile House, where the temperature ranges between 80° and 84° Fahrenheit — a temperature that seemed ideal for a tropical snake. But *was* it the right temperature?

The more I thought about this, the more I wondered. Such high temperatures are usual in the tropics in the daytime — but the Bushmaster is a snake that is active at night, especially on rainy nights, when the temperature is much lower. Tropical forests are not the continuously sweltering regions they are often pictured as being; many nights at Simla one sleeps comfortably under one or more blankets.

Years ago Dr. Beebe and Dr. John Tee-Van had recorded ground temperatures at night in the forests of British Guiana, and I had a few records of night temperatures in Trinidad. Examination of these figures convinced me that we should be keeping our Bushmaster at a temperature nearer 70° than 80°.

This certainly seemed an unorthodox heat level for a tropical snake, but when I remembered the shivering nights that followed hot days I felt that it was worth a trial. Almost exactly one month after the Bushmaster had arrived in the Zoo, and after it had refused 12 offerings of meals, we moved the cage into our refrigerated exhibition area kept cool for the benefit of the Tuatara and salamanders. We did bring the mercury up a little, to 70°-72° Fahrenheit. Four days later the Bushmaster ate its first voluntary meal.

That was encouraging, but we were a little doubtful about leaving it for protracted periods in such a comparatively cool place, and so when it refused the next food offering we moved it back to the warm quarantine room. Four meals were offered and refused in the next two weeks, so it was returned to the cold room. The first food offering at the lower temperature was declined, but the next four were taken. A minor change was made in the cage and the next meal was refused, but the following four were taken.

Apparently we are on a road that leads to success, but we are still not sure what is the important factor. Is it temperature, or the relatively reduced light and greater quiet in the refrigerated unit, or is it simply that this snake started to eat for some unknown and even unsuspected reason? We do not yet know, but we have learned that a Bushmaster will eat and can digest food at a temperature of 70° Fahrenheit, and that this one ate more regularly and oftener than any Bushmaster we have ever had in the collection previously, except for the record specimen from Prof. Urich.

We are still experimenting and trying to isolate the important factors; then we hope to check them against experiences with other Bushmasters. Some day, certainly, we will learn exactly how to go about keeping this interesting snake in captivity. In the meantime, this "pilot" Bushmaster is teaching us a great deal.

* * *

As I intimated at the beginning of this article, the Bushmaster has a bad reputation. It is not entirely deserved.

is the way the public sees of our Bushmasters. A large imen is being exhibited in e-way-glass compartment.

The Bushmaster sees only its own reflection in the glass, which now mirrors Photographer Dunton working from a door at the back.

It *is* the longest venomous snake in the Western Hemisphere, occasionally reaching a length of more than 12 feet. In consequence of its large size it has long fangs and can inject a sizable amount of venom. It assumes a peculiar defensive posture, drawing the forward part of its slender body into a series of obliquely vertical S loops, and from this position it can lunge out in a frighteningly high strike. People have died from the bite of the Bushmaster.

But apart from these facts, the true nature of this interesting snake is hidden in a tangle of exaggerations, conflicting claims and completely erroneous legends. In most of the areas where it occurs, from Costa Rica to Brazil, it is generally feared out of all proportion to its actual menace. Few persons are bitten by snakes, even fewer are bitten by venomous snakes, and — relatively speaking — virtually no one is ever bitten by a Bushmaster. Where statistics are available on snakebites in tropical America, the Fer-de-lance and the South American Rattlesnake account for far more human fatalities than does the Bushmaster.

As more and more information is gathered about this snake, it comes to be seen as a shy and retiring reptile that is usually bewildered by its contacts with human beings. We are hearing of an increasingly large number of instances in which Bushmasters were handled with impunity, in the belief that they were harmless. Naturalists who have encountered them in the wild consider them a negligible hazard. Certainly they are not aggressive and do not bite without provocation. The evidence indicates that most or all bites occur when the snake is stepped on or come upon so suddenly that it cannot escape. Nevertheless I know two persons who claim to have stepped on Bushmasters without being bitten. Less than 10 per cent of recorded Bushmaster bites were fatal.

If it is not as bad as its reputation, it still has that sinister name, Bushmaster, to produce thrills in Zoo-goers. And for that reason if no other we are pleased at the prospect of being able to keep a Bushmaster in the collection.

Zoo News In Pictures

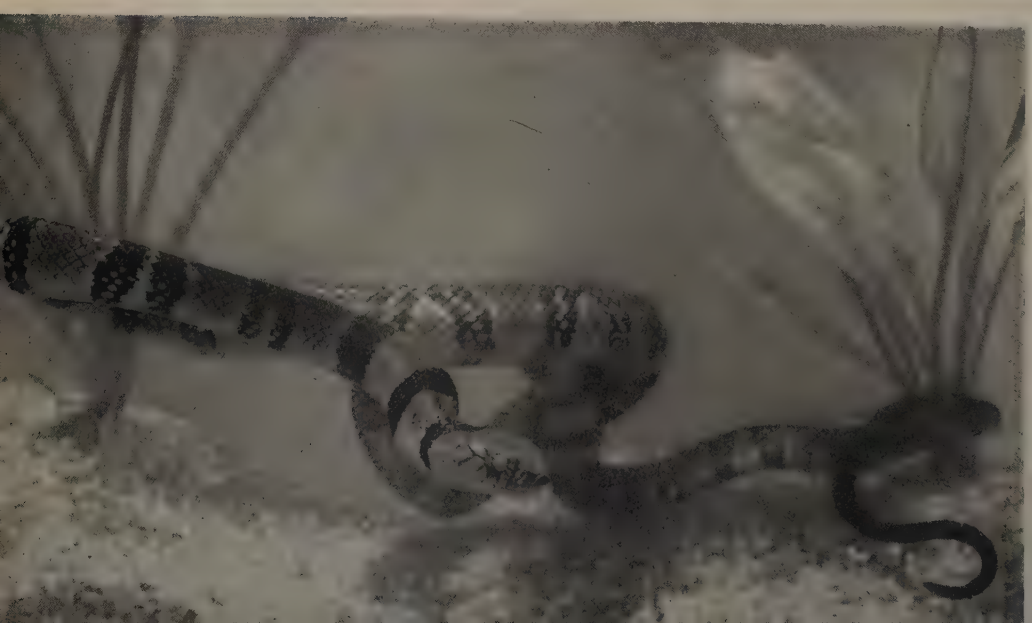
By Sam Dunton

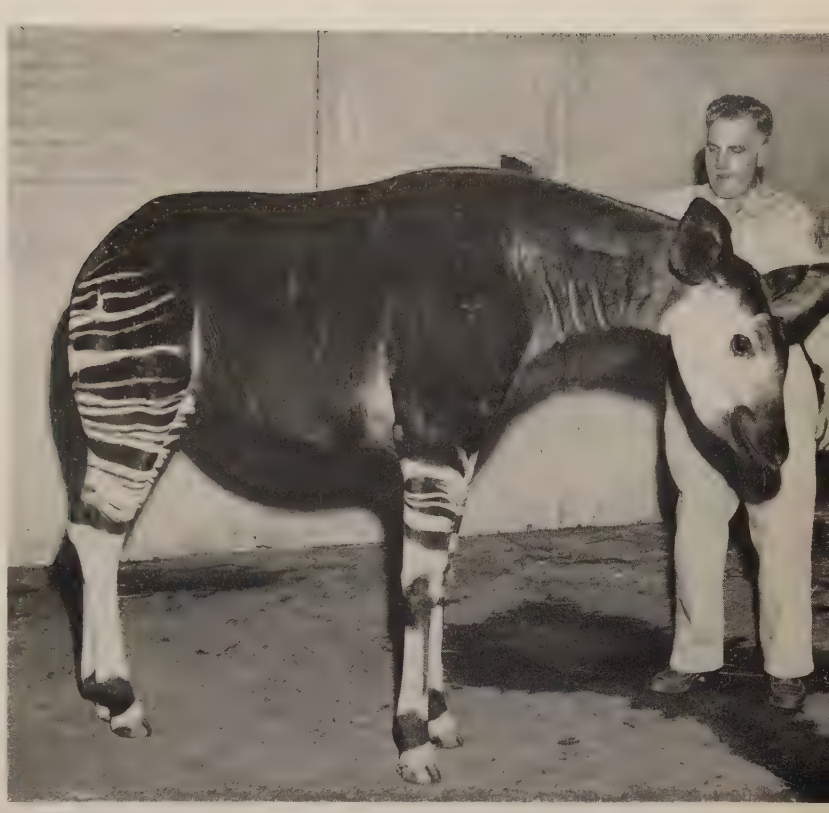
When the Curator of Reptiles a few years ago suggested that we name our young **BLACK-FACED CHIMPANZEES** for the characters in "Little Women" – Amy, Jo, Beth and Meg – we were so taken with the idea that all young Chimpanzees in the Great Apes House collection have been given those names ever since. These are the latest. The four previous Little Women had begun to be just a little on the elderly side, and had lost much of their playfulness.

A modern psychologist (or perhaps a psychiatrist would be better qualified) should have some interesting observations to make about the young **ELEPHANT SEAL** so readily accepting a fish from the hands of Associate Curator of Mammals George while Assistant Head Keeper of Mammals Rolla and Keeper Viserto look on. This is the male Elephant Seal which became so aggressive towards "Olaf," the Walrus at the Aquarium, that he had to be transferred to the Zoological Park – and there, in the Sea Lion Pool, he in turn was so terrified by playful "Benny," a young California Sea Lion, that for weeks he ate almost nothing and seldom went into the water. In desperation we finally moved him to the comparative seclusion of the Seal Pool where his only companions are a female Harbor Seal and a female Gray Seal. Immediately his timidity disappeared, his aggressiveness did not return, and he is taking six to sixteen pounds of mackerel every day, with good appetite.

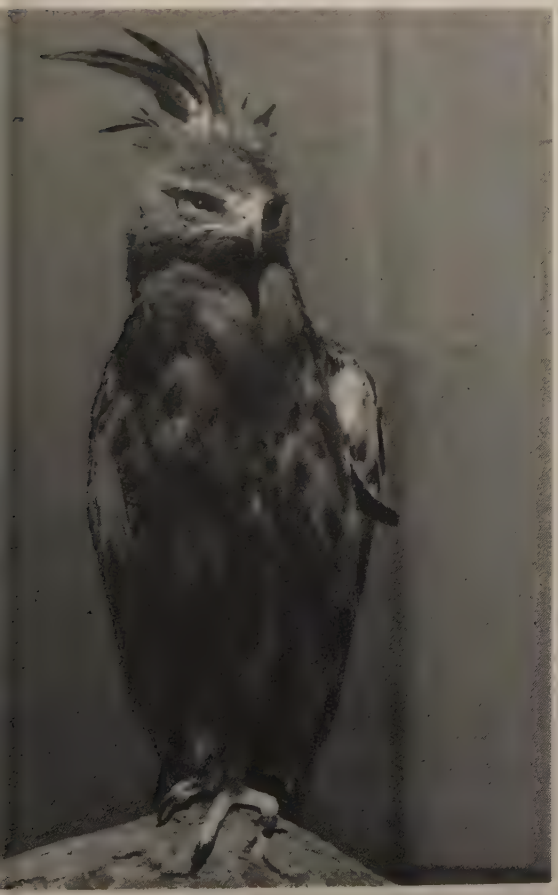
Family portrait: **DACCA AND HER LATEST CUBS.** Well before Christmas the cubs (now weighing about 100 pounds each) will be on their way to Europe and exhibition in some German zoological garden. They are the 28th and 29th cubs born to Dacca, our magnificent Tiger mother, since her own birth in the Bronx Zoo in 1944. Previous youngsters have gone to zoos in Belgium and Australia and in cities coast to coast over the United States.

You might think the picture at the left represented Christmas morning in the Reptile Department. Actually it is the uncrating of a welcome gift of **MARINE IGUANAS, LAND IGUANAS** and young **GIANT TORTOISES** collected on the Galapagos Islands and presented to us by Rudolph Freund, an artist for Life Magazine. *Left to right:* Keepers Lannon, Cummins, Curator Oliver, Keeper Brazaitis. *Below:* This big Land Iguana rushed at Dr. Oliver with mouth open when first taken out of the box, but in a few days was accepting banana from his hand. *At Bottom:* A vigorous specimen of the **WATER COBRA**, *Boulengerina annulata annulata,* from Africa, a reptile we have been seeking for a long time. It will be put on exhibition in the Reptile House.

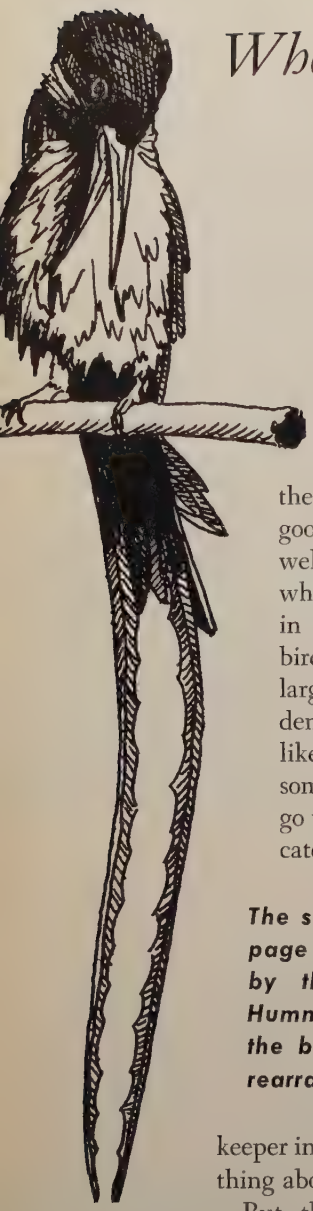




When "Muyoni," our female **OKAPI**, came to us from the Belgian Congo in the fall of last year, she was heavily infested with parasites and had numerous scars and abrasions on her skin. Since then, thanks to the well-calculated medication administered by Dr. Goss, the parasite count has dropped to safe levels, "Muyoni's" appetite has improved, she has put on weight, and the scars have almost disappeared. She obviously enjoys a daily rubbing down with a stiff brush by Keeper Dapolite.



Left – Some months ago this **LONG-CRESTED HAWK EAGLE** was shot down as it swooped low over a chicken coop near Arusha in Tanganyika. Its left wing was so badly damaged that it cannot fly, but it makes an impressive exhibit nevertheless. *Below* – These are the first **HAMMERHEADS** we have had in 20 years and they are now on display in the Large Bird House. Their home is Africa and Madagascar. Hammerheads are famous for their nests. They build a typical platform nest in a low tree, roof it over and end with a big, domed structure of sticks and twigs cemented together by mud. The birds enter this roomy nest through a narrow tunnel.



When a Bird Preens Itself—
IT ISN'T VANITY!

By WILLIAM G. CONWAY

Illustrations by the Author

BIRDS spend a good deal of time preening; zoo ornithologists spend much time watching birds; therefore, zoo ornithologists see a good deal of preening. And it is well that they do, and remember what they see, for not a day passes in which a knowledge of normal bird behavior goes unused in a large collection. Experience has demonstrated that sick birds are likely to preen their feathers in some abnormal fashion, or let them go unattended. Unkempt plumage catches the attention of a good bird keeper instantly and tells him to do something about it.

The sketches on this and the next page show various attitudes taken by the Red-billed Streamer-tail Hummingbird while preening. Both the bill and the feet are used to rearrange and clean the feathers.

But the care that birds give their plumage is by no means a simple and uncomplicated business, and the novice must learn what is normal. A new employee once commented to me how interesting it was that a flamingo reached his long leg up behind and over his wing to scratch his head feathers, just as that long-legged shore bird, the stilt, does. I immediately went to see the flamingo in question, for while stilts do drop their wings and reach over them to scratch their heads, flamingos do not. Sure enough, this flamingo had done so because it had a broken humerus.

It took considerable periods of observation to show the novice attendant that kiskadees, stilts and grosbeaks, for example, always reached up and over the wing to scratch their heads, while cranes, flamingos and many other birds never did. These birds just reach the foot up directly and scratch away. It is only natural to inquire, "Well, couldn't a bird change his mind and do it another way?" We'll have to answer no, not very likely. Head scratching patterns seem constant for the species and like much bird behavior seem to be a very narrowly channeled affair. I must confess a small and annoying doubt in making this dogmatic statement. I once thought I saw a normal Rose-breasted Grosbeak scratch his head from under the wing!

The purposes and advantages of normal preening are obvious. While feathers are wonderfully light, strong, elastic structures and make excellent cold and shock insulators, raincoats and aerodynamic surfaces, they are subject to dirt, disease and disorder. Preening with its accessory activities of bathing, dusting, and sunning is the avian system of personal hygiene. (These latter activities are all so complicated as to require separate consideration). While of course there are differences in preening behavior in bird groups, the similarities rather than the differences bring me up sharply from time to time. Watching a tiny Costa Rican Snow-cap Hummingbird raise and rotate its left elbow to straighten an underwing feather is thought-provoking; especially when one has just seen a huge North African Ostrich performing precisely the same maneuver.

Parasites such as lice and mites are at constant war with their bird hosts. Preening, especially by small, fine-billed species, would appear to be a very important parasite control and health measure, although we must feel that birds with large and comparatively clumsy bills, such as toucans and storks, would be at a disadvantage not only

in combating ectoparasites but in most other benefits of bill preening. It does seem strange that birds with greatly modified beaks such as parrots, eagles, spoonbills and flamingos have not evolved greatly different preening techniques. Some birds do seem to preen more extensively than others. Our Australian Tawny Frogmouth and our Whip-poor-will and night-hawks rarely preen, at least in the daytime when we can observe them. In contrast, some callistes and our native Downy Woodpeckers seem tirelessly concerned with personal hygiene.

Feather arrangement is one of the principal concerns of preening birds, and we need only to watch birds fly or maneuver to appreciate how important proper alignment of the plumage is to them. The feathers must constantly slide over one another without becoming enmeshed or damaged or offering resistance. Feathers, like hair, are dead structures; if they are damaged they will not heal and the bird must wait until the next molt for replacement. Fragile as they may seem to us, they must have long-wearing qualities, for unless they are pulled out entirely (whereupon they start growing back immediately), they are replaced only once or at best twice a year.

A contour feather is not a solid unit but a complexly arranged branching structure. Two vanes, each composed of countless parallel, branching pieces with interlocking hooks, are centrally connected to a shaft to make up a feather. These fragile vanes are often separated by contact with solid objects, and one of the chief preening occupations of a bird is for the purpose of squeezing separated barbules back into position. I remember sleeping on an old-fashioned feather mattress years ago. It was not a new mattress, but the softness and springiness of this old bed surprised me. It was an impressive testimonial to the durability and elasticity of feathers.

Much of a bird's feather alignment seems to occur when it ruffles and shakes its plumage. Everyone who owns a canary or budgerigar is accustomed to seeing his bird suddenly grow in size as it raises its feathers at right angles to its body. A vigorous shake and vertical feathers are pulled down one upon the other like a row of falling dominoes — in perfect alignment. Of course this activity is a stretch motion as well and illustrates the control exercised by birds over their feathers. Thousands of tiny muscles are devoted solely to the control of feathers and it is always interesting to watch the play of feather movement and control exercised during preening. I used to enjoy hearing visitors comment while watching a Bird of Paradise or Cock-of-the-Rock preening, "Why my Budgie does that!" Recently, however, I overheard a different inflection from a footweary father: "Humph! Our Budgie does that!" We now feel slightly apologetic that our magnificent rarities indulge in such a commonplace business as preening!

With the exception of penguins and a few other groups whose feathers grow evenly over their bodies, birds grow feathers in special areas called feather tracts. Except on these closely "planted" tracts, birds are mostly bare. We use this knowledge when assessing a bird's condition. Feathers often hide the emaciation of newly-imported birds and we part the breast feathers, which often grow only from the sides, to judge the bird's actual robustness by the plumpness of its breast muscles seen between the feather tracts. This method of judging health is especially useful when purchasing rarities from animal dealers. It may seem undignified to subject a lovely Quetzal in its coat of shimmering golden-green to such housewifely meatmarket tactics, but dealers' prices fall amazingly when confronted by a peaked breastbone!

The differences in basic preening patterns, from species to species, seem related to the distribution and location of the feather tracts. A bird with a long or ungainly bill, such as a toucan or stork, cannot preen the feathers nearer to its head than the distance the tip of its bill will reach. However, these birds can rub their heads and necks against their backs and scratch these areas with their feet. In this connection it is interesting to note

that some birds, such as herons and some goat suckers, have special comb-like modified claws on their feet—although we are not too sure how they are used or with what degree of effectiveness.

The Kiskadee, like the stilts and grosbeaks, always reaches up and over the wing to scratch its head. Theoretically it could do this another way, but preening patterns are quite constant.

Human beings do not worry much about combing their hair, or about hygiene in general, until they are several years old, but preening is one of the first coordinated actions that birds perform. I have watched nestling woodpeckers and flycatchers make unmistakable preening motions before they have any feathers to be preened. Other birds such as ducks and pheasants, which are clothed in down at hatching, begin preening almost as soon as they are free of the egg. We make use of this behavior when rearing certain kinds of ducks and swans which do not readily feed under artificial conditions. We sprinkle crumbled hard-boiled egg yolk and starting rations on the backs of the newly-hatched ducklings and cygnets. In their frequent preening the birds cannot help but get some of this food in their bills and they soon learn that it is edible.

Young growing birds preen their new feathers constantly, worrying the splitting sheaths on their sprouting plumage. Adults aid their annual molting process in the same way. The molt for penguins brings on a preening orgy. Unlike other birds, they molt their entire plumage at once. This is a period of great physiological strain and the molting bird becomes inactive and does not feed. Preening is its one constant activity as it works over its plumage, aiding in the gradual divestment of the old coat and the proper clearing of the new. I always marvel at the extreme flexibility of the bird neck when I watch one of our portly Emperor Penguins reach down and preen its leg feathers. I get the incredulous feeling of a spectator watching a circus fat man attempting to tie his own shoes.

Preening must be considered by the aviculturist when he makes up diets for his birds. For example, European Redshanks, which are slender, long-legged sandpipers, very much enjoy chopped fish. However, they fail to wipe their bills after eating and what happens when satisfied "Shanks" preens with a fish-smeared bill is not hard to imagine.

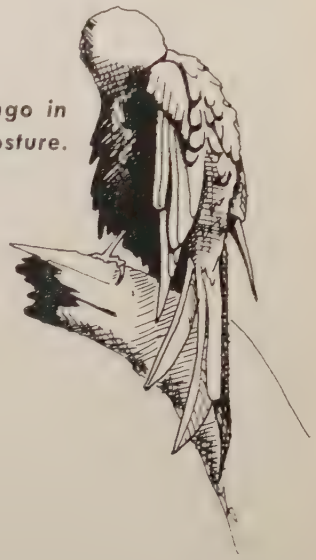
Members of the parrot family, especially love-

birds, are well known for their habit of preening each other. Actually, many birds indulge in mutual preening and, surprisingly, many of the invitational postures assumed by preening birds are common to very diverse groups. In one of the commonest postures, the bird bends the head downward and erects the feathers on the back of the head and upper neck—an area it cannot reach with its own bill. We have all seen parrots assume this position and trustingly offer their exposed necks to the powerful bills of their cage mates. Strange preening alliances frequently de-

velop in captivity. Our Indo-Malayan Exhibit houses a catbird-sized Black-headed Sibia which regularly preens with a sparrow-sized Blue-winged Siva — a rather touching picture. I once kept an incompatible pair of Red Birds of Paradise that nevertheless would preen each other with the utmost care during their brief truces. At first I shuddered to watch the aggressive female minutely attend the eyelids of her belligerent mate with her dagger-sharp bill. Actually, however, most birds, within a species, show a great respect for their fellows' eyes. Mutual preening plays a part in the courtship of some birds and seems important in the maintenance of the pair bond.

Another type of preening which has received a great deal of attention in recent years is so-called "displacement preening." The case of Messrs. Brown and Jones may illustrate the point. Imagine the following situation: Brown weighs 225 pounds while Jones weighs 115; Brown insults Jones; consequently, Jones would like to punch Brown in the nose, but he does not! Instead, he grits his teeth and digs his fingernails into his palms. Roughly speaking, Jones's teeth grinding and palm puncturing are displacement activities arising from his unsafe desire to punch Brown in the nose. Many birds faced with similar situations refrain from pecking or some other aggressive activity and preen instead. Displacement preening is often quite formalized and characteristic in a bird group. Last May, when I entered the Whooping Crane enclosure in the Audubon Park Zoo in New Orleans, where Crip and Josephine were feeding their two chicks, Josephine walked towards me. When I set up my movie camera near the chicks, she came closer and began preening her tertial feathers. Many a less distinguished crane had preened tertials at me in the past and I quickly recognized that Josephine would have liked very much to punch me in the nose! I moved back ten feet and she immediately stopped preening and went about her normal feeding chores. Birds newly introduced in group exhibits frequently engage in extended bouts of displacement preening. At first they are frightened and unfamiliar with cage peck order; however, an aviculturist who does not realize this may get completely erroneous impressions.

Still another situation is often seen in Birds of Paradise. Several in our collection seem to spend time apparently arranging their plumes for proper display erection before engaging in a courtship display. Our Blood's Long-tailed Bird of Paradise has curiously-shaped tufts of feathers on either side of its breast which are normally concealed



A Scissor-tailed Drongo in a typical preening posture.

under the wings, but are erected over the head in display. When preparing to display, this bird uncovers these tufts and preens them carefully. It may be that there is some displacement action in this behavior, stemming from the bird's increasing urge to display.

With the exception of ostriches, emus, rheas and some birds of several other Orders, birds are equipped with an oil gland near the base of the tail. Emperor Frederick II in his Thirteenth Century work on falconry commented on the oil gland and its possible uses. While the intervening centuries have shed much light on the significance of this gland, its full importance is not yet completely agreed upon. Birds do take oil from the gland and apparently dress their feathers and even their legs with it, and this is one of the most prominent of preening activities. There is an indication that the irradiated oil from the uropygial gland, ingested during preening, is a source of Vitamin D in some species. For many years the preening-oiling process was considered important as an aid in repelling water, especially in ducks. This subject is now more controversial, though I am inclined to feel this waterproofing function is a valid one. Some

ornithologists have even gone so far as to state that bird feathers have no oil in them. These "doubting Thomases" will profit from a trip to our Large Bird House and a visit to the Concave-casqued Hornbill. This huge hornbill anoints the white feathers of his crown and his white wing patches with so much yellowish oil that these areas become quite yellow. It has been suggested that this is a decoration and the areas so colored are prominent in threat postures.

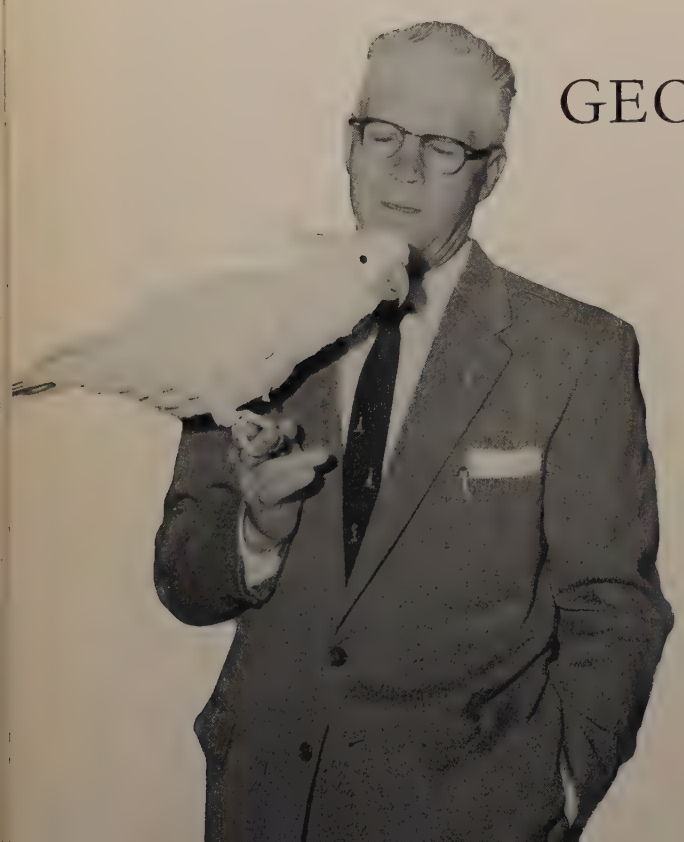
Removal of the oil gland and then observation of the bird would seem helpful in determining the function of the gland. A number of such studies have been made, but the results are conflicting. W. H. Elder reports that ducks without oil glands developed plumage abnormalities, dry and cracked skin on their feet and legs, and dry, peeling bills. Unfortunately for the clarity of the situation, his birds' bills, feet and legs recovered by their third summer! James Fisher, in his excellent book, *The Fulmar,* states that this bird discharges waxy stomach oil when preening, and dresses its feathers with this oil. The Fulmar has a well-developed uropygial gland which it presumably uses as well. Mr. Fisher points out that this tube-nosed species discharges oil through its nostrils while preening, and makes the interesting observation that tubular nostrils are found only in birds which produce stomach oil (such as petrels and albatrosses). He believes that tubular nostrils are an anatomical adaptation for preening.

One of the most intriguing feather-dressing adaptations is the powder down patch. These dense patches of down-like feathers grow continually, the tips breaking up into a fine white greasy-feeling powder. The powder is helped to permeate the birds' plumage during preening and herons are said to rub their beaks on the powder down patches. The purpose of the down appears to be waterproofing and insulation. I frequently noted, with a start, how thin and porous the plumage of a mounted egret feels. The live healthy birds' feathers feel dense and cohesive – almost sticky. This dense feeling seems to be due to thorough permeation by the greasy powder down. Dry-cleaning bills, on too many occasions impel me to add that the aviculturist who incautiously handles a bird with powder down is likely to emerge looking like a worker in a flour factory.

Busier than ever!

GEORGE SCOTT

By LEE S. CRANDALL



WRITING AN ACCOUNT of the career of George Scott, our recently retired Head Keeper of Birds, is no ordinary task. For George is not an ordinary man and doing him justice, without risk of eulogy, presents a problem. It might be said, briefly, that he came to us in 1923, that he became Head Keeper in 194[illegible] that he was a very good Head Keeper and we regret that retirement regulations ended his service to us on November 19, 1957. But that, of course, gives no picture of the man or of how he became

George Scott and "Cocky," an old friend.

what he is. Perhaps a factual, straight-forward story will not seem too filled with praise.

George Scott was born near Southampton, England, and spent his boyhood there. His reminiscences of those early days are replete with tales of his grandmother, a redoubtable woman who once carried a donkey across a stream because it would not walk. But she had her softer moments and it was from her that the young George learned to care for the birds that he caught with a tup'ny tin of bird lime from the corner shop. She taught him, too, how to rear the young starlings and blackbirds that, fallen from the nest, were in need of help. Such matters were common events in the lives of boys in the English countryside of those days but few had opportunity to apply to more serious purpose the knowledge they gained.

With the outbreak of World War I in 1914, George took to arms and soon found himself in France with Britain's "contemptible little army." His experiences as a Contemptible, sometimes hilarious, sometimes heart-breaking and always thrilling, were innumerable but through it all he came unscathed. After the war's end, in 1918, Scott shipped aboard a Cunarder as a steward and so passed several uneventful years. He might very well have continued in this service but for a curious coincidence.

For some time we had been planning an exchange of birds with the Zoological Society of London but shipment had been delayed for lack of a dependable caretaker for the week-long ocean voyage. It was then that the resourceful Sam Stacey, then our Head Keeper of Birds, had one of the best ideas of his long career. His niece had married a boy named Scott, who was a Cunard steward. The Scott boy had had some early experience; perhaps he could act as caretaker. We took the chance and it turned out that Scott not only could, but did — not once but several times. Never were trans-ocean exchanges carried out more successfully. When, in 1923, we needed a promising assistant keeper in the Bird Department, young Scott was our first thought. So it was that on May 14 of that year, our hopeful took up his new duties and soon was followed to this country by his wife, Georgina, and their small brood.

It must have been hard going for George in those early days. Stacey was a strict task-master, a man of then unequalled experience, who knew exactly what must be done and how to do it. There was also the point that Scott was his niece's husband and there must be no hint of favoritism. But George was well trained in the necessities of discipline and applied himself to following instructions and learning as he went. When retirement ended the distinguished career of Samuel Stacey, in 1941, George Scott by natural succession became Head Keeper.

Our bird collections grew and prospered under Scott's painstaking care. Hummingbirds became a special interest and our continuing success with these delicate little creatures has been due entirely to his unflagging devotion to essential details. In 1949, when Charles and Emy Cordier were about to leave the Belgian Congo with their incredible living cargo, George Scott was dispatched to give them the help without which they could not have completed their successful mission. When Sir Edward Hallstrom, in 1953, offered to present to several American zoological gardens a marvellous collection of living Birds of Paradise, it was George Scott who was chosen for the difficult assignment. By way of Australia, he was flown to Sir Edward's station in central New Guinea, got his birds out only by the exercise of grim determination and ingenuity and finally came triumphantly eastward across America, dropping off Birds of Paradise at their destinations on his way, with not a single loss en route.

In the spring of 1957, with his sixty-fifth birthday and fixed retirement date looming closer, on November 19, George was making plans for the rehabilitation of the strawberry patch on a little farm in nearby Dutchess County. But all this was put aside to answer a call from the Federal Government for an aviculturist to supervise the rearing of the young Whooping Cranes it was hoped might hatch from the two precious eggs then being incubated by Crip and Jo in the Audubon Park Zoo in New Orleans. Strawberry patches might wait, but not young Whooping Cranes. So early in May, off went George to see what might be done to avoid past disappointments. On his return on August 6, he had left the world richer by two vigorous young Whoopers, then nearly as tall as their parents and the

first of their kind to be bred and reared in captivity. Long nights spent in nursing ailing chicks or fitfully sleeping on an army cot alongside the wired enclosure, were forgotten.

Plans for the farm again became foremost. But again they were set aside in response to the need for an expert to set up an aviary for the International Exposition to be held in Venezuela in 1959-1960. So on August 27, the Scotts were off to Caracas on a six months' mission. Accumulated time, vacation and terminal leave should have released George from active duty in mid-June but his actual retirement date came and went with no cessation.

Sometime George Scott will return, leaving Caracas with aviary well stocked and personnel well trained. Sometime that strawberry patch will receive the attention it has lacked so long. But just when that time will come cannot be foretold, for while a good man may formally retire he cannot completely disappear. Who knows what calls for help may come in the future?

News from the Conservation Foundation

Ten-Week Television Program Launched

The National Broadcasting Company, over Channel 4 in New York City and 29 Educational Television Stations throughout the nation, is presenting a ten-week television program entitled "Survival: The Story of Man, Resources and Civilization." Albert Burke, currently a member of the staff of our organization, has prepared the scripts and acts as host and narrator of this dynamic presentation of man's role in changing the face of the earth. In New York the series began on Saturday, November 23, and it may be seen on Channel 4 in New York each Saturday at 4:30 p.m. for ten successive weeks.

Research on Use of Pesticides

The Foundation and the New York Zoological Society have together sponsored an investigation by Dr. John L. George of the present state of knowledge of dangers in mass spraying to control destructive insects which from time to time threaten agricultural crops and forests. Dr. George's report indicates the need for far greater knowledge than now exists of the ecological effects of mass spraying, the controls that need to be used if spraying is found necessary, the question of immunization from spraying, the possibilities of alternative controls by the use of parasites, and the extent of damage to or destruction of all forms of life. Further research will be sponsored by the two organizations within the coming year. In the meantime, the report recommends extreme caution and limitation of spraying until further knowledge is available.

Dr. Osborn Addresses American Foresters

On November 13 Dr. Fairfield Osborn gave the banquet address at the annual meeting of the Society of American Foresters at Syracuse. The title of his address was "Natural Resources and World Populations." He and Peter M. Stern also spoke before the Women's City Club of New York on November 19 on "Unplanned Use of Land throughout the World."

Expansion of Population Studies

In cooperation with the Population Council plans have been made whereby Robert G. Snider will devote his full time in 1958 to expansion of the Population Study Program beyond the island of Jamaica to include Barbados and other colonies in the Caribbean. Mr. Snider has been responsible for the highly successful program now nearing completion in Jamaica. Its preliminary findings have proved so effective that installation of similar programs in other colonies in the near future appears probable. These programs aim to establish local committees of prominent private

citizens to present to the people of the islands, through interviews and meetings, the effect of too rapid population growth and the importance to individual human welfare of maintaining family size within the economic capacity of the family.

Industrial Use of Resource Technicians

A report on the findings of the first Industrial Conference, organized by Roger Hale of our staff and sponsored by the Foundation, will be published this fall. The conference, held at Ann Arbor, Mich., analyzed the need of various industries for resource technicians, the type of graduate training available in American universities, and possible modifications in the type of training to meet the needs of industrial employers. The second conference, scheduled at Ann Arbor for January 13 and 14, 1958, will explore the personnel requirements of industries in connection with land-use planning and area development. Representatives of the National Planning Association, the Association of American Railroads and the Edison Electric Institute will participate with educators in the forthcoming conference. Increasing recognition of the responsibility of industry for wise resource development and use is encouraging.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

WHOOPING CRANES: THEIR STATUS NOW AND A PROGRAM FOR 1958

By WILLIAM G. CONWAY

WITH TWO CRANES reared in captivity this year, the Whooping Crane population is now the highest in seven years. The latest tally reveals one adult crane at the San Antonio Zoo, two adults and two young at the Audubon Park Zoo in New Orleans, and twenty-two adults and four young cranes wild on the Aransas Refuge, a total of thirty-one birds.

On November 15, as the body of the wild Whooper population settled down for the winter on the refuge in Texas, delegates from all over the United States and Canada came to the annual convention of the National Audubon Society in New York and listened to a discussion of the Whooping Crane's status. The speakers rose in turn to present their respective viewpoints about the captive or wild populations: George Douglass, Superintendent of the Audubon Park Zoo; myself from the New York Zoological Park; Daniel Janzen, Director of the Bureau of Sports Fisheries and Wildlife; and Director Maier of the Canadian Wildlife Service. John Baker, President of the National Audubon Society, expressed the Society's view.

Mr. Douglass gave an interesting review of the history of the captive Whooping Cranes in his care, as well as an account of their breeding. He praised the conscientious work of George Scott, the Bronx Zoo's Headkeeper of Birds (now retired) in the successful 1957 rearing program. Mr. Janzen discussed the loss of the wild King Ranch crane last summer. He noted that the bird, captured at the suggestion of the Whooping Crane committee with the expectation that it would become a mate for the San Antonio bird, had proved to be an extremely emaciated specimen. At its death, soon after it was captured, it was found to be a female. The San Antonio bird is also presumed to be a female. Mr. Janzen stated that there are no plans for capture of wild Whooping Cranes in the future for captive-breeding experiments. Mr. Maier described the Canadian nesting grounds in detail. He commented especially on the impenetrable nature of the area and discussed safety measures to preserve the region from molestation.

My own talk gave a picture of modern crane culture as now practiced in many zoos, and I ad-

vocated a breeding program for "Crip" and "Josephine," the Audubon Park birds, based on the most modern techniques. I pointed out that at least 14 of the 23 forms of cranes have been successfully bred in captivity. Six crane hybrids have been bred. Thirty-eight years (for a bird in the collection of Lady Lilford in England) is the longest recorded captive span for a Whooping Crane. One Whooper lived for nearly 24 years in the Bronx Zoo.

I expressed the opinion that the young cranes at Audubon Park Zoo should be separated from their parents no later than December, as the adults will become dangerous to the young with the commencement of a new breeding period. For the present, young captive-reared cranes should be pinioned to avoid the likelihood of injury should they attempt to fly in their enclosures. We know of no records of captive-reared cranes successfully breeding before their fifth year. While most cranes normally lay only two eggs each season, if these eggs are taken away as soon as laid, the birds will usually lay another clutch. The Ueno Zoo in Tokyo has obtained as many as five clutches from a single pair of cranes in a single season.

Because of the many hazards associated with rearing the young cranes with their parents in a paddock, I advocated that at least the first clutch of eggs from the New Orleans birds be taken for artificial incubation and rearing. Such a program would allow us to hope that "Josephine" will lay a second clutch and thus the normal production of young would be doubled. This is not a new idea, but one that experienced aviculturists throughout the country have advocated. Mr. Douglass, who has done so much for the cranes already, visited the Bronx Zoo following the Audubon convention and discussed crane problems and the institution of the new program in 1958. He indicated his eagerness to attempt the artificial rearing program, so we may look forward to the most exciting Whooping Crane season yet!

Animal Census Reaches 1,001 Species on October 31

The routine monthly census of mammals, birds, reptiles and amphibians in the Zoological Park on October 31 revealed that we now have 1,001 species and subspecies — the first time the collection has exceeded the 1,000 mark in a number of years.

As nearly as we can determine from available records, the San Diego Zoo is the second largest Zoo in the United States in numbers of different kinds of animals, with 917 species and subspecies at the time of its mid-year census.

First Aid to Baby Kangaroos

The Animal Hospital has recently had two occasions to practice "veterinary pediatrics" by replacing baby kangaroos in their mothers' pouches. While this is not a rare occurrence, it is always an interesting one. The first baby was almost old enough to leave the pouch of its own accord — but not quite. It was found on the floor of the cage by a keeper, cold and almost lifeless, but fortunately rallied with the warmth and nourishment furnished in the pouch. The second was a newborn infant approximately one inch long that had never been in the pouch; it was first seen while it was crawling on its mother and trying to find the opening of her pouch. Eventually it lost its hold and fell to the floor, but since it showed no sign of injury it was placed in the pouch and is presumably still there and thriving.

Closed for the Winter

By long custom, November 11 is closing day for certain of the Zoological Park's activities. When the Children's Zoo closed for the season it had a recorded attendance of 325,340, some 30,000 more visitors than last year. The Farm-in-the-Zoo and Question House also closed for the winter on November 11.

Genetics Laboratory Gets Support from National Cancer Institute

For the tenth consecutive year the Genetics Laboratory of the Aquarium has been given a grant in principal support by the National Cancer Institute of the U.S. Public Health Service. The amount granted for 1958 is $16,940.

Dr. Myron Gordon, the Aquarium's Geneticist

"Olaf," the young Walrus at the Aquarium, swims on his back more often than any other way, and seems to enjoy an endless circling of the big Oceanic Pool. Astonished visitors like it, too.

was organizing chairman of the Fourth Conference on the Biology of Normal and Atypical Pigment Cell Growth held at the M. D. Anderson Hospital and Tumor Institute of the University of Texas Medical Center at Houston on November 14-16. A grant of $7,000 was received from the Damon Runyon Memorial Fund in support of the conference.

Department of Tropical Research Off to Trinidad in December

The Department of Tropical Research starts its 59th Expedition in December. The coming season will be spent at Simla, in the Northern Range of Trinidad, B.W.I., with old problems continued and new projects initiated. Under a recent grant from the National Science Foundation, Dr. William Beebe and Dr. David Snow will work on ornithological problems, among which are the courtship of manakins and the habits of subterranean swifts. A new motion picture camera will be available and a tape recorder will be used to record the voices of birds. Jocelyn Crane will continue her investigations of butterflies. Henry Fleming will delve deeper into the inter-relationships of tropical moths. The first of the season's guest investigators will be Dr. Anne Alexander of South Africa, who will study the behavior of Peripatus and Black Scorpions. — William Beebe

"Little Mambo" Now Weighs More than Sumaili

When Sumaili, our Mountain Gorilla, arrived from the Belgian Congo on May 15, 1949, she weighed only a trifle over 16 pounds — about the same as Mambo, our young Lowland Gorilla which came to us on May 15, 1951. By reason of her extra two years, Sumaili has been well ahead of Mambo in weight, so that we have long had the habit of referring to the young male as "Little Mambo." In the past few weeks, however, he is no longer little in relation to Sumaili.

At weighing time in mid-July, each animal weighed exactly 250 pounds. By September, Sumaili had managed to lose 10 pounds, as growing gorillas are apt to do, while Mambo had picked up 15 pounds. In mid-November, Mambo was well out in front, with 281 pounds, and Sumaili was trailing with 259.

Our young Giant Otter in the Small Mammal House has long since learned that Keeper Bergmann is a friend who brings him fish every day.

Mambo has not yet learned that he now has the size and strength to dominate his companion. Sumaili, now as for all the time since the two have been kept together in the Great Apes House, is the dominant animal. Her rule is never malicious, but it is firm and unmistakable.

Latest Research on Electric Eel Uses Micro-electrodes

For more than twenty years Director Christopher W. Coates of the Aquarium and associates from various hospitals and laboratories have been studying the Electric Eel and its extraordinary discharges, and gradually they are coming closer to a fundamental understanding of the mechanism of the production and discharge of the current. Recent advances are described by Mr. Coates and Dr. Mario Altamirano in the *Journal of Cellular and Comparative Physiology*. The article is concerned with the effects of potassium on the individual current-producing unit, the electroplax. Studies of what goes on in the electroplax – which is only about one millimeter wide – were made possible by the development of a technique for inserting several micro-electrodes into different parts of a single electroplax. Because the eel's electric organs operate essentially the same as nerve tissue, they have become a valuable research tool and the importance of the continuing investigations lies less in explaining the functioning of the eel than in understanding the physiology of nerves in general, including those of man.

PUBLICATIONS OF INTEREST

THE GALATHEA DEEP SEA EXPEDITION. Described by Members of the Expedition. 296 pp., 240 illustrations, 1 folding map. The Macmillan Co., New York. $8.00.

Not all the great scientific projects of recent years have been devoted to atomic bombs, earth satellites or human diseases. In 1950, the Danish sloop *Galathea* set out on a two-year journey around the world to explore the depths of the sea – a trip that has already taken its place among the leading scientific expeditions of all time. Its primary object was to discover and study what life exists two and a half miles or more below the surface of the ocean. To that end the ship was equipped with a powerful winch and nearly 7½ miles of heavy wire, as well as other special apparatus, some of which was designed specifically for the occasion. With this equipment the *Galathea* was able to probe 6⅛ miles into one of the deepest parts of the sea and to bring to the surface two species of worms, a clam, a sea-cucumber and an anemone, in addition to abundant bacteria. We now know that life extends to the very depths of the ocean where pressures are more than a thousand times greater than those at sea level.

Deep-sea operations were only one phase of the intri-

ate program of the *Galathea*, however, and this book describes the planning and execution of them all. Although no serious mishaps marred the expedition and most things went as planned, there were many occasions when excitement ran high. Few books have so authentically portrayed the thrills and satisfactions of scientific discovery. — J. W. A.

ANTARCTIC HAZARD. By W. Ross Cockrill. 230 pp., 21 illus., map end-papers. Philosophical Library, New York, 1957. $4.75.

Veterinarians who go whale-hunting are seemingly a special breed — good writers as well as professional men. Robertson, who wrote "Of Whales and Men" a few years ago, was a veterinarian; so is Cockrill, the author of this exciting and literate book. Cockrill's job was to advise on the production of whale meat for human consumption in the British market. It was a losing game, but it produced an entertaining and informative book. — W. Br.

HANDBOOK OF SNAKES OF THE UNITED STATES AND CANADA. By Albert Hazen Wright and Anna Allen Wright. Two Volumes, 1106 pp., 306 illus., 70 maps. Comstock Publishing Associates, Cornell University Press, Ithaca, New York, 1957. $14.75.

Publication of this long-awaited work is a notable event for North American herpetology, the authors and the publishers. These volumes complete the series of Comstock handbooks on the major groups of amphibians and reptiles of the United States and Canada, a series initiated by the Wrights and produced under the editorship of Dr. Wright. Thanks to their diligence and hard work, herpetologists now have a complete set of reference books covering the natural history, characters, habits and distribution of every salamander, frog, turtle, lizard and snake in the area covered — and virtually every form is illustrated by black and white photographs taken in life.

In the United States and Canada as a whole there are more different kinds of snakes than of any other reptiles or amphibians, and thus two volumes were necessary to cover the pertinent information. This has some disadvantages but permits the inclusion of more material. For each snake the topics are arranged as follows: name of snake; geographic range, including a list of states and elevations; size; length of life; distinctive characteristics; color; habitat; period of activity; breeding, including information on eggs and young; ecdysis; food; venom; enemies; field notes; and authorities. The last named includes references to herpetologists who have published observations on the animal in question. For some topics the mass of detail is a distraction and further summarization would have been desirable. However, the Wrights' aim was to make their accounts complete and in this they have attained a high degree of success. These two volumes are sure to be used constantly by anyone interested in information about our native snakes. All naturalists owe the Wrights a great debt of thanks for their copious and valuable contributions to North American natural history — J. A. O.

TREASURY OF SNAKE LORE. Edited by Brandt Aymar. XVI + 400 pp. Greenberg: Publisher, New York, 1956. $5.00.

"The snake is a wondrous creature. He has fascinated, frightened, inspired his own worship, symbolized all the evil in the world, and aroused the curiosity of mankind ever since things began. No wonder he has captured the imagination for better or worse, of writers of all ages and all nations." With this idea in mind, Brandt Aymar has brought together in this book some of the literature, prose and poetry, factual and fictional, that has resulted from the impact the snake has made on mankind. Most of the works included here have been selected for their literary rather than their scientific qualities. They are grouped in selections from a wide variety of sources from the Bible, mythology, fable, serpent worship, essays, short stories, mystery stories, tall tales, selections from novels, accounts of personal adventure, drama, an account of the Hopi Snake Dance, and a number of poems. The role of the snake varies in the different selections. Anyone interested in reptiles, general natural history or just interesting reading, will find much pleasure in this volume. — J. A. Oliver

FISHES OF THE WORLD. Edouard Le Danois and others. 190 pp., 118 photographs in black-and-white, 30 in color, 7 sketches. The Countryman Press, Woodstock, Vermont. Distributed by A. S. Barnes & Co., New York. $12.50.

A good introduction sometimes makes all the difference, since it can permanently influence one's reactions to a person or subject. For this reason, if no other, experts in fish and fisheries should be pleased with this beautiful book. It is hard to imagine anyone not being captivated by fish as they are described in the author's vivid style and depicted in the book's magnificent photographic reproductions. More than a third of the black-and-white photographs were taken from the files of the New York Zoological Society and illustrate specimens once on exhibition at the New York Aquarium. We have never seen them reproduced so well. Those who know their fishes, however, will be perplexed by the gross, inexcusable errors that mar the captions for several of the illustrations. — J. W. Atz

LIVING REPTILES OF THE WORLD. By Karl P. Schmidt and Robert F. Inger. 266 illustrations, 145 in color. 287 pp. Hanover House, Garden City, N. Y., 1957. $10.00.

This is a splendid book about reptiles. The text is interesting and informative; the illustrations are excellent for the most part. Unfortunately, as with almost all other good things today, the price is too high. This will keep the book out of the hands of many of the young naturalists who will covet it.

Until his sudden death just before publication of the book, Karl P. Schmidt was Curator Emeritus of Zoology at the Chicago Natural History Museum; Robert F. Inger is Curator of Reptiles at that institution. Both are recognized authorities in herpetology.

The book deals in general terms with the living reptiles of the world, taking them up in order: turtles, the Tuatara, crocodilians, lizards and snakes. Within each of the major groups or orders, each of the separate families is considered and several representative species are discussed. The treatment is primarily systematic and emphasis is placed on the evolutionary adjustment of the modern forms, with frequent references to natural history or relations to human beings. The authors have been highly successful in condensing a vast amount of information into a relatively limited text. — J. A. Oliver

New Members of the New York Zoological Society

(Between September 1 and October 31, 1957)

Life

Herbert R. Axelrod
Kurt F. Frey, Sr.
Walter P. Marshall

Contributing

John B. E. Allen
Mrs. Paul L. Anthony
Mrs. Lee Ault
Frank Butterworth, Jr.
Thomas M. Debevoise
Edward W. Egan
Henderson Emanuel
Dr. Harry Y. Fong
Mrs. David S. Gamble
Dr. Donald M. Gibbons
Mrs. Elizabeth S. Habif
Dr. Alice Hampshire-Silver
Dr. Edward A. Hardy
Dr. Calderon Howe
Miss Dena Humphreys
Mrs. James N. Hynson
Mrs. David S. Jackson
Dr. Arthur J. Lapovsky
Dr. Vance Lauderdale, Jr.
Robert E. Leoni
Miss Rita Minotta
Morton Nelkin
Miss Elsie Jean Quigly
Robert Rose
Dr. Russell J. Sacco
Mrs. B. H. Saunders
Richard Schlosberg
Howard B. Shookhoff
Dr. Arthur M. Sutherland

Annual

Dr. Gerard Aitken
William A. Austin
Walter Bennett
Dr. George Bochow
Arthur Bowers
Mrs. Joseph Brady
Dr. Gordon M. Bruce
Carl Bussow
Miss Joy Chute
Emil Cohen
Dr. Margaret C. Collins
Toban H. Colton
Dr. Gabriel A. Covo
Dr. Joseph B. Cramer
Dr. A. M. Cutler
Dr. Wilburta Daltroff
John B. Dodd
Dr. Jack Elinson
Dr. Jeanne A. Epstein
Dr. Don W. Fawcett
Dr. Joseph B. Furst
Peter Garofolo
Avrom Goodman
Dr. Soll Goodman
Dr. Alfred Halpern
Charles W. Heckman
Stephen Andrew Johnson
John D. Karlsson
Dr. Louis Kleinfeld
Bruce Koloski
George Lande
Dr. Robert A. Lane
Wesley E. Lanyon
Mrs. Arthur Lembke
Miss Sara Lenley
Dr. Virginia Lubkin
Dr. Joachim Luwisch
Dr. Adeline W. Martin
Dr. Margaret Harper McKee
Samuel Misler
Mrs. Jesse C. Mizelle, Jr.
Dr. Joseph F. Montague
Dr. Theodora Nelson
Dr. Stephen Nordlicht
Melville W. Osborne
Dr. Haig P. Papazian
N. Polay
Dr. Hans F. Prausnitz
Gottlieb Price
Dr. Orrea F. Pye
Dr. Peter Richter
Dr. Frederick Rosenberg
Dr. David H. Schonholz
Dr. John J. Scott
Mrs. Alexander Seelig
Ross B. Socolof
Arthur P. Spear, Jr.
Master Christi Stokowski
Master Stani Stokowski
Mrs. Richard W. Thoma
Calvin A. Thompson
Jack Walker
Mrs. E. Wall
Mrs. Dorothy Wingard
Miss Bertha Wittlinger
Dr. Leo Wollman
Dr. A. Zabin

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